

# PATENT ABSTRACTS OF JAPAN

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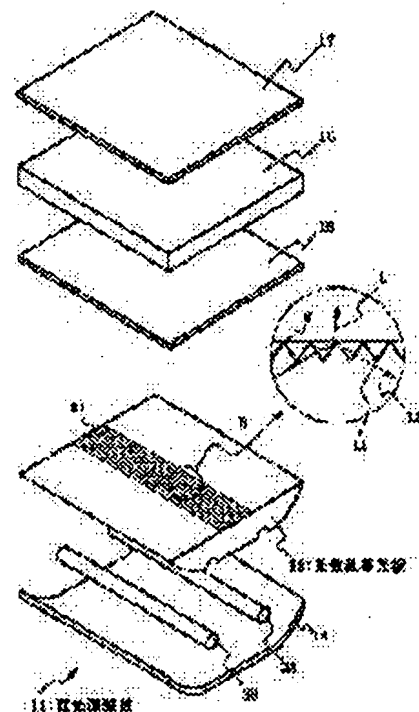
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## (54) SURFACE LIGHT SOURCE DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To decrease the total thickness of a surface light source device and to reduce unnatural nonuniform luminance of the emitted light by forming a light transmitting plate wherein fine particles are dispersed and incorporated and promoting the emission of an illuminating light by the light quantity correcting face formed on a part or the whole of the emitting face except the part directly above the light source.

**SOLUTION:** A light scattering and transmitting plate 12 is formed by injection-molding a specified resin, and a resin wherein illuminating light diffusing particles are dispersed and incorporated in a matrix consisting of polymethyl methacrylate, for example, is appropriately used. This fine particle is a light transmitting fine particle (silicone-resin fine particle) having a refractive index different from that of the matrix. Further, a light quantity correcting face M1 promoting the emission of an illuminating light is formed on the light scattering and transmitting plate 12 at almost the central part between fluorescent lamps 3A and 3B except the part directly above the lamps 3A and 3B. The correcting face M1 is formed by repeating the same repeating shape having a slope orthogonal to the extending direction of the lamps 3A and 3B.



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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is applied to the surface light source equipment of the type which embedded the rod-like fluorescent lamp at the light guide plate, and has arranged it, concerning the surface light source equipment applied to a liquid crystal display etc. In this surface light source equipment, while this invention carries out distributed mixing of the particle and forms a light guide plate, by urging the outgoing radiation of the illumination light according to the quantity of light amendment side formed in some or all of an outgoing radiation side except right above the light source, it thin-shape-izes the whole thickness, and reduces the unnatural brightness nonuniformity of outgoing radiation light.

[0002]

[Description of the Prior Art] In the former, for example, a liquid crystal display, there are side light mold face light equipment which has arranged the fluorescent lamp which becomes by the primary light source to the tooth-back side of a liquid crystal display panel, and surface light source equipment of the type which has arranged this fluorescent lamp directly at the tooth back of a liquid crystal display panel. In the surface light source equipment of this latter, it is thought that there is the description that the use effectiveness of the illumination light is high, and the intensity level of outgoing radiation light can be improved as compared with that part side light mold face light equipment as compared with side light mold face light equipment according to extent to which the illumination light which carried out outgoing radiation carries out incidence to a fluorescent lamp again, and re-excites a fluorescent substance being smaller than a fluorescent lamp etc. Moreover, by the ability arranging the light source at a tooth back, only the part (a part for the tooth space for arranging the light source) reduces a part for the lobe to the side, and it is thought that a whole configuration can be miniaturized.

[0003] That is, drawing 24 is the decomposition perspective view showing the surface light source equipment of an indication in JP,2-62585,A. After it embeds fluorescent lamps 3A and 3B at a light guide plate 2, this surface light source equipment 1 arranges a reflecting plate 4 at the tooth back of this light guide plate 2, and carries out the laminating of the amount amendment sheet 5 of transmitted lights, and the optical diffusion plate 6 to the outgoing radiation side of a light guide plate 2, and is formed in it.

[0004] A light guide plate 2 is formed in an abbreviation rectangle configuration of the acrylic of transparence, and a flat top face is assigned to an outgoing radiation side here. Furthermore, the slot of the cross-section the configuration of U characters embedding fluorescent lamps 3A and 3B is formed in a tooth back, and board thickness reduces a light guide plate 2 gradually in the both sides of these slots, and a slant face is formed. More nearly thereby than an outgoing radiation side, outgoing radiation of the light guide plate 2 is directly carried out about the component below a critical angle among the illumination light which outgoing radiation is carried out and carries out incidence to an outgoing radiation side from fluorescent lamps 3A and 3B. Moreover, about the component beyond a critical angle, it reflects between an outgoing radiation side and a slant face, the incident angle over an outgoing radiation side is reduced below to a critical angle, and, more nearly thereby than the outgoing radiation side near the both ends of the light guide plate 2 in the direction which intersects perpendicularly with the longitudinal direction of fluorescent lamps 3A and 3B, outgoing radiation of these illumination light is mainly carried out.

[0005] A reflecting plate 4 reflects the illumination light which begins to leak from a tooth back, returns it to the interior of a light guide plate 2, and, thereby, improves the use effectiveness of the illumination light. The amount amendment sheet 5 of transmitted lights equalizes quantity of light distribution of the transmitted light by reflecting partially the illumination light by which outgoing radiation is carried out, and returning to the interior of a light guide plate 2 from a light guide plate 2. namely, the quantity of light distribution of the illumination light by which outgoing

radiation is carried out as a sign a1 shows drawing 25 from a light guide plate 2 -- fluorescent lamps 3A and 3B -- almost -- right above -- most -- large -- becoming . The amount amendment sheet 5 of transmitted lights forms a dot pattern in a transparence web material, and is created. this dot pattern vapor-deposits a minute metal membrane partially by vacuum evaporatio~~no~~, and forms here -- having -- quantity of light distribution of incident light -- corresponding -- fluorescent lamps 3A and 3B -- if it keeps away from right above fluorescent lamps 3A and 3B most densely right above mostly, it will be formed so that a consistency may fall. Thereby, the transparence sheet 5 amends quantity of light distribution of the illumination light, as an arrow head A shows.

[0006] The optical diffusion plate 6 is formed of the plate of translucent opalescence, diffuses the outgoing radiation light of the amount amendment sheet 5 of transmitted lights, and carries out outgoing radiation according to desired quantity of light distribution. Thereby in surface light source equipment 1, it is made as [ carry out / efficiently / the outgoing radiation of the illumination light ] as compared with side light mold face light equipment.

[0007]

[Problem(s) to be Solved by the Invention] By the way, in this kind of surface light source equipment, when the whole thickness is made thin, the problem which unnatural brightness nonuniformity generates is in outgoing radiation light.

[0008] That is, in this kind of surface light source equipment, if it is difficult to amend quantity of light distribution completely and it makes the whole thickness thin as a sign a2 shows drawing 25 even if it diffuses the illumination light with the optical diffusion plate 6 after the amount amendment sheet 5 of transmitted lights amends quantity of light distribution of outgoing radiation light, the quantity of light will come to fall between fluorescent lamp 3A and 3B. When the quantity of light increases rapidly on those both sides, the part to which this quantity of light fell is perceived very easily, and reduces the grace of the illumination light remarkably.

[0009] This invention was made in consideration of the above point, and tends to propose the surface light source equipment which can thin-shape-ize the whole thickness and can reduce the unnatural brightness nonuniformity of outgoing radiation light.

[0010]

[Means for Solving the Problem] In order to solve this technical problem, it sets to this invention. The plate-like part material which carried out distributed mixing of the particle, and the light source which is embedded and arranged at plate-like part material at the tooth-back side of this plate-like part material, and carries out outgoing radiation of the illumination light to plate-like part material, a part of illumination light by which is arranged at the outgoing radiation side side of this plate-like part material, and outgoing radiation is carried out from plate-like part material -- reflection - - and -- or it has the amount amendment side of transmitted lights which amends quantity of light distribution of the transmitted light, and the optical diffusion member which diffuses and carries out outgoing radiation of the illumination light by which outgoing radiation is carried out from this amount amendment side of transmitted lights by absorbing. In still such a configuration, right above the light source is avoided to previous plate-like part material, and the quantity of light amendment side to which the outgoing radiation of the illumination light is urged in all or some of outgoing radiation side is formed in it.

[0011] Moreover, the amount amendment side of transmitted lights is replaced with the configuration arranged to the outgoing radiation side side of this plate-like part material, and the same quantity of light amendment side is formed in the configuration which arranges to the tooth-back side of plate-like part material.

[0012] It forms so that board thickness may become thin as plate-like part material is kept away from the light source toward a side face in these cases.

[0013] Moreover, it replaces with this, and plate-like part material is formed so that the whole may serve as fixed board thickness.

[0014] Furthermore, in these cases, the slot arranged almost in parallel is formed in plate-like part material, the light source is arranged into these slots and a previous quantity of light amendment side is formed among these slots.

[0015] It forms so that the quantity of light distribution of the illumination light by which outgoing radiation is carried out from an optical diffusion member in a quantity of light amendment side may furthermore form an almost single peak in these cases.

[0016] Moreover, in these cases, a quantity of light amendment side is formed according to a split face.

[0017] Moreover, it replaces with this, and the repeat configuration which has a slant face for a quantity of light amendment side is repeated and formed.

[0018] When forming a quantity of light amendment side according to a split face furthermore, extent of a split face is changed partially.

[0019] moreover, the case where repeat a repeat configuration and a quantity of light amendment side is formed -- the repeat pitch of this repeat configuration, and a configuration -- and -- or magnitude is changed partially.

[0020] If distributed mixing of the particle is carried out and plate-like part material is formed, the bias of the quantity of light distribution of the illumination light by which outgoing radiation was carried out that much than the light source can be amended. Moreover, right above the light source is avoided, and if the quantity of light amendment side which urges the outgoing radiation of the illumination light to all or some of outgoing radiation sides is formed, an intensity level can be improved in the formation location of this quantity of light amendment side. Even if it selects a quantity of light amendment side suitably and thin-shape-izes a whole configuration with extent of dispersion in plate-like part material etc. by this, the unnatural brightness nonuniformity of outgoing radiation light can be reduced.

[0021] Moreover, the same quantity of light amendment side is formed in the configuration which arranges the amount amendment side of transmitted lights to the tooth-back side of plate-like part material, and similarly, even if it selects a quantity of light amendment side suitably and thin-shape-izes a whole configuration, the unnatural brightness nonuniformity of outgoing radiation light can be reduced.

[0022] That is, this board thickness can amend the fall of the intensity level about the part which became thin by forming plate-like part material so that board thickness may become thin, as it keeps away from the light source toward the edge of an outgoing radiation side.

[0023] Moreover, it replaces with this, and when forming plate-like part material so that the whole may serve as fixed board thickness, corresponding to this configuration, the formation location of a quantity of light amendment side etc. can be chosen, and the unnatural brightness nonuniformity of outgoing radiation light can be reduced.

[0024] If the slot arranged almost in parallel is formed in plate-like part material, the previous light source is arranged into these slots and a previous quantity of light amendment side is furthermore formed among these slots in these cases, the intensity level which falls between this slot can be amended.

[0025] If a quantity of light amendment side is furthermore formed in these cases so that a peak with the quantity of light distribution of the illumination light almost more nearly single than an optical diffusion member by which outgoing radiation is carried out may be formed, outgoing radiation of the high illumination light of grace can be carried out.

[0026] concrete -- a split face -- or the repeat configuration which has a slant face can be repeated and the outgoing radiation of the illumination light can be urged with a simple configuration by forming a quantity of light amendment side.

[0027] the case where it forms a quantity of light amendment side with a repeat configuration by changing extent of a split face partially in forming a quantity of light amendment side according to a split face furthermore -- the repeat pitch of this repeat configuration, and a configuration -- and -- or outgoing radiation of the illumination light can be carried out according to desired quantity of light distribution by changing magnitude partially.

[0028]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained in full detail, referring to a drawing suitably.

[0029] (1) Gestalt drawing 1 of the 1st operation is the decomposition perspective view showing the surface light source equipment concerning the gestalt of operation of the 1st of this invention. After it embeds fluorescent lamps 3A and 3B at the light-scattering light guide plate 12 which becomes with a light guide plate, this surface light source equipment 11 arranges the reflective sheet 14 at the tooth back of this light-scattering light guide plate 12, and carries out the laminating of the amount amendment sheet 15 of transmitted lights, the optical diffusion plate 16, and the prism sheet 17 as optical control-section material to the outgoing radiation side of a light guide plate 2, and is formed in it.

[0030] The light-scattering light guide plate 12 carries out injection molding of the predetermined resin, and is formed, and the resin which carried out distributed mixing of the particle which diffuses the illumination light is applied with the gestalt of this operation here into the matrix which consists of polymethylmethacrylate (PMMA), for example. This particle is a particle (the particle of a silicone resin system, the Toshiba Silicone make, toss pearl 120) of the translucency from which a matrix and a refractive index differ, for example, distributed mixing is carried out at a rate of 0.2-1.0 [wt%]. Thereby, the light-scattering light guide plate 12 is made as [ amend / the illumination light by which outgoing radiation was carried out is scattered about efficiently, and / from fluorescent lamps 3A and 3B, / the bias of quantity of light distribution ].

[0031] Furthermore, the light-scattering light guide plate 12 is formed for example, in a rectangle configuration, and a flat top face is assigned to an outgoing radiation side. Furthermore, the light-scattering light guide plate 12 is formed in a thin shape as compared with the conventional light guide plate 2 ( drawing 24 ), and the slot of the shape of a cross section of U characters which embeds fluorescent lamps 3A and 3B at a tooth back is formed. Moreover, in the both sides of these slots, board thickness decreases gently and a slant face is formed of a curved surface. the reflection [ carry out outgoing radiation of the light-scattering light guide plate 12 by this than an outgoing radiation side,

scattering the illumination light by which outgoing radiation is carried out from fluorescent lamps 3A and 3B inside, and / as opposed to / this time / an outgoing radiation side ] between an outgoing radiation side and a slant face about a component with a big incident angle -- and -- or the incident angle over an outgoing radiation side is reduced below to a critical angle according to a scattering effect, and outgoing radiation is carried out from an outgoing radiation side.

[0032] Furthermore, as for the light-scattering light guide plate 12, the quantity of light amendment side M1 between fluorescent lamp 3A and 3B which avoids right above fluorescent lamps 3A and 3B into a central part, and urges the outgoing radiation of the illumination light to it mostly is formed. This quantity of light amendment side M1 repeats the same repeat configuration which has a slant face in the direction which fluorescent lamps 3A and 3B extend, and the direction which intersects perpendicularly, and is formed in it here so that an arrow head B may show. With the gestalt of this operation, the slot of a cross-section triangle configuration is formed in parallel with fluorescent lamps 3A and 3B as this repeat configuration.

[0033] Thereby, the quantity of light amendment side M1 carries out outgoing radiation of the illumination light L which carries out incidence the include angle beyond a critical angle to an outgoing radiation side from an outgoing radiation side, and the outgoing radiation of the illumination light is urged to it. In addition, in the enlarged drawing shown with this sign B, a sign L1 shows the illumination light which reflects the outgoing radiation side when not forming a slot according to this outgoing radiation side M with Sign M. That is, the illumination light which outgoing radiation was carried out from fluorescent lamps 3A and 3B, and carried out incidence into the light-scattering light guide plate 12 will advance the inside of the light-scattering light guide plate 12, and will arrive at the outgoing radiation side of the light-scattering light guide plate 12. At this time, in the field between fluorescent lamps 3A and 3B, the component of illumination light from fluorescent lamps 3A and 3B which carries out incidence to the light-scattering light guide plate 12 with a big include angle to the outgoing radiation side of the light-scattering light guide plate 12 will increase, and it will carry out [ most illumination light ] incidence at a big include angle to the outgoing radiation side of the light-scattering light guide plate 12 in this field by this. Although the illumination light has arrived at the outgoing radiation side between fluorescent lamp 3A and 3B in the light guide plate 2 ( drawing 24 ) of a configuration conventionally from these things, it turns out that outgoing radiation of the many is not carried out.

[0034] On the other hand, like the gestalt of this operation, according to the light-scattering light guide plate 12, the component which are scattered about efficiently inside and carries out incidence of the component of such illumination light at an angle of below a critical angle to the outgoing radiation side between fluorescent lamp 3A and 3B can be increased, and the outgoing radiation quantity of light from an outgoing radiation side can be increased. Furthermore, if the slot of a cross-section triangle configuration is formed in addition to this, outgoing radiation can be urged also about the component which carries out incidence the include angle beyond a critical angle to an outgoing radiation side.

[0035] Thereby, by the comparison with the case (sign N1) where the quantity of light amendment side M1 is not formed at all in drawing 2 , with the gestalt of this operation, the light-scattering light guide plate 12 can be formed in thin meat, and the intensity level between fluorescent lamp 3A and 3B can be increased so that a sign N2 may show. In addition, in this drawing 2 , it is the result of having arranged the reflective sheet 14, and omitting the amount amendment sheet 15 of transmitted lights, the optical diffusion plate 16, and the prism sheet 17, and measuring directly the intensity level in the outgoing radiation side of the light-scattering light guide plate 12.

[0036] It sets to the light-scattering light guide plate 12 in carrying out. it writes -- the inclination of the formation range of the quantity of light amendment side M1, and the slant face of a cross-section triangle configuration It corresponds to spacing between extent of light scattering in the configuration of the light-scattering light guide plate 12, and the light-scattering light guide plate 12, fluorescent lamp 3A, and 3B, and extent of pattern NINGU in the amount amendment sheet 15 of transmitted lights. It is made as [ select ] without perceiving the fall of the intensity level between fluorescent lamp 3A and 3B so that a peak with the distribution of the illumination light more nearly single than surface light source equipment 11 by which outgoing radiation is carried out may be formed namely, and so that the luminance distribution of the display screen by the cathode-ray tube may be approached. Incidentally, with the gestalt of this operation, the formation range of the quantity of light amendment side M1 is chosen, and such luminance distribution is secured.

[0037] The reflective sheet 14 is formed of the scattered reflection member of the shape of a sheet which becomes with a specular reflection member or a white PET film of the shape of a sheet which becomes by a metallic foil etc., and is arranged at the tooth back of the light-scattering light guide plate 12 with a double-sided tape. Thereby, the reflective sheet 14 reflects the illumination light which begins to leak from this tooth back, it carries out incidence to the light-scattering light guide plate 12, and it improves the use effectiveness of the illumination light. In addition, it is also possible to replace with using this reflective sheet 14, and to form a reflector in the inside of the case (chassis) where

the light-scattering light guide plate 12 is held.

[0038] The amount amendment sheet 15 of transmitted lights forms a dot pattern on the polyester film of transparency, and is created. This dot pattern is formed of the minute metal membrane which vapor-deposited aluminum partially, and it is formed here so that it may decrease as the formation consistency of this metal membrane keeps away from right above fluorescent lamps 3A and 3B most densely right above fluorescent lamps 3A and 3B. Thereby, from the light-scattering light guide plate 12, the amount amendment sheet 15 of transmitted lights reflects partially the illumination light by which outgoing radiation was carried out, returns it to the interior of the light-scattering light guide plate 12, and equalizes quantity of light distribution of the transmitted light.

[0039] By the comparison with the case (sign N3) where the quantity of light amendment side M1 is not formed at all in drawing 3, this amends quantity of light distribution of the illumination light with the gestalt of this operation so that a peak with the illumination light almost more nearly single than this amount amendment sheet 15 of transmitted lights by which outgoing radiation is carried out may be formed, so that a sign N4 may show.

[0040] The optical diffusion plate 16 is formed by the acrylic board of translucent opalescence, diffuses the outgoing radiation light of the amount amendment sheet 15 of transmitted lights, and carries out outgoing radiation according to desired quantity of light distribution. The prism sheet 17 is optical control-section material which amends the directivity of outgoing radiation light, it is formed by the web material of translucency, such as a polycarbonate, and a prism side is formed in the light-scattering light guide plate 12 and a reverse side face. The projection of the cross-section triangle configuration extended almost in parallel is repeated by the one direction, and this prism side is formed in it. Thereby, the prism sheet 17 is the slant face of a projection of this triangle configuration, and amends the main direction of outgoing radiation of outgoing radiation light in the direction of a transverse plane of an outgoing radiation side.

[0041] In the above configuration, after carrying out incidence of the illumination light by which outgoing radiation was carried out from fluorescent lamps 3A and 3B to the interior of a light guide plate 12, it arrives at an outgoing radiation side and outgoing radiation of the component below a critical angle is carried out to an outgoing radiation side more here than an outgoing radiation side. On the other hand, after being reflected in respect of outgoing radiation, it is reflected on a slant face and the incident angle over an outgoing radiation side reduces the component beyond a critical angle here. Thereby, more directly than an outgoing radiation side, after reflecting a slant face, outgoing radiation of the illumination light by which outgoing radiation was carried out from fluorescent lamps 3A and 3B is carried out.

[0042] In addition to the above-mentioned operation, moreover, the illumination light which carried out incidence to the interior of the light-scattering light guide plate 12 further The particle of the translucency by which distributed mixing was carried out inside the light-scattering light guide plate 12 by the time outgoing radiation was carried out from the outgoing radiation side receives a dispersion operation (multiple scattering). The component which carries out incidence below by the critical angle to an outgoing radiation side by this will increase, outgoing radiation will be efficiently carried out from an outgoing radiation side, and the bias of the quantity of light distribution observed from an outgoing radiation side as the result is reduced.

[0043] Moreover, the illumination light which carries out incidence to the quantity of light amendment side M1 between fluorescent lamp 3A and 3B among the illumination light which arrives at an outgoing radiation side By [ which carry out incidence at an angle of below a critical angle to the slant face of a configuration repeatedly ] having formed the component beyond a critical angle in the quantity of light amendment side M1 to the outgoing radiation side As compared with the part which does not form the quantity of light amendment side M1 at all, it is urged to the outgoing radiation from the light-scattering light guide plate 12, and, thereby, the outgoing radiation quantity of light from the light-scattering light guide plate 12 increases between fluorescent lamp 3A and 3B.

[0044] Thus, the illumination light by which outgoing radiation was carried out from the light-scattering light guide plate 12 is further equalized in response to diffusion, in case the continuing optical diffusion plate 16 is penetrated after having carried out incidence to the amount amendment sheet 15 of transmitted lights, being reflected partially here, being returned to the interior of the light-scattering light guide plate 12 and equalizing quantity of light distribution.

[0045] While according to the above configuration carrying out distributed mixing of the particle and forming a light guide plate, by forming the quantity of light amendment side M1 which urges the outgoing radiation of the illumination light to the outgoing radiation side between fluorescent lamp 3A and 3B, as compared with the former, a whole configuration can be thin-shape-ized and the unnatural brightness nonuniformity of outgoing radiation light can be reduced.

[0046] (2) Gestalt drawing 4 of the 2nd operation is the sectional view showing the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 2nd of this invention. This light-scattering light guide plate 20 is replaced with the light-scattering light guide plate 12 mentioned above about drawing 1, and is



arranged. As compared with the light-scattering light guide plate 12 concerning the gestalt of the 1st operation, an outgoing radiation side is expanded and formed in the direction which intersects perpendicularly with fluorescent lamps 3A and 3B, and this light-scattering light guide plate 20 is made as [ increase / that much / the distance D from each fluorescent lamps 3A and 3B to a side face ].

[0047] Corresponding to this, the repeat configuration of the same configuration as a central part is repeatedly formed in the both-sides side side of this outgoing radiation side in the light-scattering light guide plate 20, and thereby, a quantity of light amendment side is formed also in a this outgoing radiation side [ that was expanded ] and both-sides side side, and it is made as [ urge / the outgoing radiation of the illumination light ].

[0048] Even when an outgoing radiation side is a large area by in addition to the central part having formed the configuration repeatedly and having formed the quantity of light amendment side in the side-face side according to the configuration shown in drawing 4, the unnatural brightness nonuniformity of outgoing radiation light can be avoided effectively.

[0049] (3) Gestalt drawing 5 of the 3rd operation is the sectional view showing the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 3rd of this invention. This light-scattering light guide plate 21 is replaced with the light-scattering light guide plate 12 mentioned above about drawing 1, and is arranged. As for this light-scattering light guide plate 21, the quantity of light amendment side M1 is formed between fluorescent lamp 3A and 3B. Furthermore, the light-scattering light guide plate 21 is formed in the crepe side (crimp side) where the fields M2 and M3 where an outgoing radiation side remains do not function as a quantity of light amendment side substantially by mat processing and where the depth of extent is shallow, and, thereby, these fields M2 and M3 are formed in a split face.

[0050] having formed in the crepe side the fields M2 and M3 where an outgoing radiation side remains according to the configuration shown in drawing 5 -- the familiarity by that amount amendment sheet of part transmitted lights -- it can decrease -- the outgoing radiation side of this amount amendment sheet of transmitted lights -- it can stick and \*\*\*\* can be avoided effectively.

[0051] (4) Gestalt drawing 6 of the 4th operation is the sectional view showing the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 4th of this invention. The quantity of light amendment side M1 is formed between fluorescent lamp 3A and 3B, and in this quantity of light amendment side M1, this light-scattering light guide plate 22 is formed so that a repeat configuration may change.

[0052] That is, in this quantity of light amendment side M1, a repeat configuration is formed in the depth direction of the light-scattering light guide plate 12 in the shape of large-sized in a central part, and it is formed in a small configuration as it keeps away from a center. Furthermore, this repeat configuration is formed so that it may decrease as a pitch keeps away from a center repeatedly corresponding to each magnitude. Thereby in this quantity of light amendment side M1, it is made as [ urge / to a more central part / the outgoing radiation of the illumination light ].

[0053] According to the configuration shown in drawing 6, a more central part can increase extent to which the outgoing radiation of the illumination light is urged by having changed the repeat configuration and having formed the quantity of light amendment side M1. The luminance distribution of outgoing radiation light can be brought close to the luminance distribution in a cathode-ray tube further much more by this, and the grace of the part outgoing radiation light can be improved further.

[0054] (5) Gestalt drawing 7 of the 5th operation is the sectional view showing the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 5th of this invention. With the resin ingredient as the light-scattering light guide plate 12 concerning the gestalt of the 1st operation with this same light-scattering light guide plate 23, the whole is formed in a monotonous configuration and the quantity of light amendment side M1 is formed between fluorescent lamp 3A and 3B.

[0055] As shown in drawing 7, even if it forms the light-scattering light guide plate 23 in a monotonous configuration, the same effectiveness as the gestalt of the 1st operation can be acquired.

[0056] (6) Gestalt drawing 8 of the 6th operation is the sectional view showing the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 6th of this invention. The whole is formed in a monotonous configuration and, as for this light-scattering light guide plate 24, the same quantity of light amendment sides M4 and M5 as the quantity of light amendment side M1 are further formed in a both-sides side side for the quantity of light amendment side M1 between fluorescent lamp 3A and 3B.

[0057] Even when an outgoing radiation side is a large area by applying a plate-like light-scattering light guide plate, in addition to a central part forming a configuration repeatedly and forming a quantity of light amendment side in a side-face side according to the configuration shown in drawing 8, the unnatural brightness nonuniformity of outgoing radiation light can be avoided effectively.



[0058] (7) Gestalt drawing 9 of the 7th operation is the sectional view showing the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 7th of this invention, and this light-scattering light guide plate 25 changes a repeat configuration in the quantity of light amendment sides M1, M4, and M5 formed between fluorescent lamp 3A and 3B and in a both-sides side side. That is, in the quantity of light amendment side M1, in the quantity of light amendment sides M4 and M5 by the side of a side face, it is made as [ select / the magnitude and the repeat pitch of a repeat configuration ] so that the outgoing radiation of the illumination light may be urged to a side-face side, so that the outgoing radiation of the illumination light may be urged to a more central part.

[0059] According to the configuration shown in drawing 9, the grace of outgoing radiation light can be further improved by having applied to the plate-like light-scattering light guide plate, having changed the configuration repeatedly and having formed the quantity of light amendment side in the central part and side-face side.

[0060] (8) Gestalt drawing 10 of the 8th operation is the sectional view showing the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 8th of this invention, and this light-scattering light guide plate 26 embeds and holds one fluorescent lamp 3 in the center on the back, and forms the primary light source in it with this fluorescent lamp 3. Furthermore, the light-scattering light guide plate 26 avoids right above this fluorescent lamp 3, and the quantity of light amendment sides M6 and M7 are formed in a both-sides side side.

[0061] According to the configuration shown in drawing 10, even when forming the primary light source with one fluorescent lamp 3, by forming the quantity of light amendment sides M6 and M7, and urging the outgoing radiation of the illumination light to a both-sides side side, a whole configuration can be thin-shape-ized and unnatural brightness nonuniformity can be reduced.

[0062] (9) Gestalt drawing 11 of the 9th operation is the sectional view showing the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 9th of this invention, and this light-scattering light guide plate 27 forms the primary light source with one fluorescent lamp 3 embedded in the center on the back. Furthermore, the light-scattering light guide plate 27 forms the quantity of light amendment sides M8 and M9 about the range in which the straight line which connects the vertical edge and outgoing radiation side of the side attachment wall of a U-shaped gutter and a straight-line part forms the critical angle theta.

[0063] According to the configuration shown in drawing 11, the illumination light which carried out incidence can stimulate the outgoing radiation of the illumination light in a part of outgoing radiation side which comes directly from a side attachment wall. The fall of an intensity level which comes to observe a side attachment wall from an outgoing radiation side can be effectively avoided by this part by this, and that much unnatural brightness nonuniformity can be prevented.

[0064] (10) Gestalt drawing 12 of the 10th operation is a drawing to which the intensity level of the outgoing radiation light is indicated to be the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 10th of this invention. This light-scattering light guide plate 28 embeds and holds three fluorescent lamps 3, 3A, and 3B ( drawing 12 (B)). Furthermore, the light-scattering light guide plate 28 is made as [ set / the magnitude and the formation period of a repeat configuration ] so that the quantity of light amendment sides M11 and M12 may be formed corresponding to these three fluorescent lamps 3, 3A, and 3B, respectively among adjoining fluorescent lamp 3A, 3 and 3, and 3B, it may incline toward the central fluorescent lamp 3 side in these quantity of light amendment sides M11 and M12 and the outgoing radiation of the illumination light may be urged. In addition, in drawing 12, a dotted line shows the magnitude of this repeat configuration.

[0065] as [ show / by this / the light-scattering light guide plate 28 / as a continuous line / three peaks of the intensity level (N5) shown with a broken line ] -- the intensity level (N6) of outgoing radiation light is amended so that one peak may be formed as a whole ( drawing 12 (A)). In addition, in this drawing 12 (A), it is the result of measuring an intensity level in the condition of having arranged only the amount amendment sheet of transmitted lights on the light-scattering light guide plate 28.

[0066] According to the configuration shown in drawing 12, even when forming the primary light source with three fluorescent lamps, outgoing radiation of the illumination light can be carried out according to the luminance distribution approximated to the cathode-ray tube, and outgoing radiation of the high illumination light of the part grace can be carried out.

[0067] (11) Gestalt drawing 13 of the 11th operation is the perspective view showing the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 11th of this invention. This light-scattering light guide plate 29 connects the light-scattering light guide plate 12 mentioned above about the gestalt of the 1st operation, and is formed. In the surface light source equipment applied to the gestalt of this operation corresponding to this, fluorescent lamps 3A and 3B, a reflective sheet, the amount amendment sheet of transmitted lights, etc. are

arranged to each light-scattering light guide plate 12.

[0068] According to the configuration shown in drawing 13, the surface light source equipment of the large area which comes to avoid unnatural brightness nonuniformity with a thin shape effectively can be obtained simply.

[0069] (12) Gestalt drawing 14 of the 12th operation is the perspective view showing the light-scattering light guide plate of the surface light source equipment concerning the gestalt of operation of the 12th of this invention. This light-scattering light guide plate connects further to the longitudinal direction of a fluorescent lamp the light-scattering light guide plate 29 mentioned above about the gestalt of the 11th operation, forms the primary light source with two pieces or four fluorescent lamps, and is created.

[0070] According to the configuration shown in drawing 14, the surface light source equipment which is a large area and a thin shape further much more, and comes to avoid unnatural brightness nonuniformity effectively can be obtained.

[0071] (13) it is the gestalt of other operations, although the gestalt of above-mentioned operation described the case where formed a V character-like slot and a quantity of light amendment side was formed so that it might extend in parallel to the direction which a fluorescent lamp extends As shown not only in this but in drawing 15, this invention may form a V character-like slot in the direction which intersects perpendicularly to the direction which a fluorescent lamp extends, may form a quantity of light amendment side, may form a V character-like slot in the direction of slant to the direction which a fluorescent lamp extends further, and may form a quantity of light amendment side.

[0072] Moreover, although the gestalt of above-mentioned operation described the case where formed a V character-like slot in the shape of a straight line, and a quantity of light amendment side was formed, this invention may form a V character-like slot not only this but in the shape of a curve, and may form a quantity of light amendment side.

[0073] Although the gestalt of above-mentioned operation furthermore described the case where formed a V character-like slot in an one direction, and a quantity of light amendment side was formed As shown not only in this but in drawing 16, this invention may form a V character-like slot in the two directions which intersect perpendicularly, may form a quantity of light amendment side, may form a V character-like slot in the direction of plurality more than a three way further, and may form a quantity of light amendment side. In addition, in these cases, it can choose suitably about these two directions and further two or more directions if needed. Moreover, when forming a slot in the direction of plurality in this way, a slot may be formed with a curve.

[0074] Moreover, although the gestalt of above-mentioned operation described the case where the repeat configuration of the cross-section triangle configuration of having a slant face by forming a V character-like slot was formed This invention can be widely applied, not only this but when setting up the flute width of a V character-like slot small as compared with a formation pitch as are shown in drawing 17, and a quantity of light amendment side may be formed by the slot of a trapezoid configuration where the base was formed in the flat surface and it is further shown in drawing 18.

[0075] Furthermore, with the gestalt of above-mentioned operation, although the case where a quantity of light amendment side was formed by forming a slot was described, as shown not only in this but in drawing 19, this invention may form a configuration in convex repeatedly, and may form a quantity of light amendment side. Moreover, as shown in drawing 20, a configuration may be repeatedly formed in a cross-section semicircle arc configuration, a quantity of light amendment side may be formed, as further shown in drawing 21, a configuration may be repeatedly formed in a cross-section sine wave configuration, and a quantity of light amendment side may be formed. Furthermore the various repeat configurations of in short having a slant face, such as a triangular pyramid, a square drill, and a cone, can be repeated, and a quantity of light amendment side can be formed.

[0076] Moreover, although the gestalt of above-mentioned operation described the case where carried out adjustable [ of the magnitude and the formation pitch of a repeat configuration ], and adjustable [ of extent to which the outgoing radiation of the illumination light is urged ] was carried out This invention is made into the approach of carrying out adjustable [ of extent to which this outgoing radiation is urged ] as shown not only in this but in drawing 22. There are the approach of carrying out adjustable [ only of the approach, the projection, or depth-of-flute T which carries out adjustable / of the repeat pitch P ], an approach of carrying out adjustable [ of inclination theta of a slant face ], the approach of combining these further, etc., these can be chosen or combined if needed and a quantity of light amendment side can be formed. In addition, even if it carries out adjustable [ of the repeat configuration itself ] in these cases, it can carry out adjustable [ of extent to which outgoing radiation is urged similarly ].

[0077] Although the gestalt of the 2nd operation of a \*\*\*\* furthermore described the case where each quantity of light amendment side was formed with the same repeat configuration, this invention is good also as a thing of a configuration which is repeatedly different in a configuration in respect of each quantity of light amendment not only this but if needed.

[0078] Moreover, in the gestalt of above-mentioned operation, although the case where a quantity of light amendment side was formed with a repeat configuration was described, this invention may form a quantity of light amendment side by forming not only this but an outgoing radiation side in the split face which has the depth more than predetermined partially, and increasing an optical diffusion function partially. In addition, adjustable [ of extent of a split face ] can be carried out in this case, and it can carry out adjustable [ of extent to which outgoing radiation is urged ]. Moreover, it is also possible to form a quantity of light amendment side combining both repeat configuration and split face.

[0079] Moreover, although the case where carried out distributed mixing of the particle which consists of silicone resin in the gestalt of above-mentioned operation, and a light-scattering light guide plate was formed was described, not only this but when replace this invention with this particle, distributed mixing of the white pigments, such as particles, such as a silica, or titanium oxide, etc. is carried out at transparence resin, distributed mixing of the silicone oil is carried out further at transparence resin and it creates a light guide plate translucent, it can be applied widely.

[0080] Furthermore, in the gestalt of above-mentioned operation, although the amount amendment sheet of transmitted lights which vapor-deposited the metal membrane partially on the transparence sheet described the case where a part of illumination light by which outgoing radiation was carried out from the light-scattering light guide plate was returned to the interior of a light-scattering light guide plate This invention may give the function of this amount amendment sheet of transmitted lights directly to the outgoing radiation side of a light-scattering light guide plate by adhering a direct metal membrane etc. to the outgoing radiation side of not only this but a light-scattering light guide plate.

Moreover, if it is surface light source equipment with which loss of a certain amount of quantity of light is permitted, it is also possible to use what formed partially the metal membrane which becomes for example, a transparence sheet from the ingredient of light absorption nature as an amount amendment sheet of transmitted lights. Moreover, it is also possible to adopt as an optical diffusion plate the configuration which gave the function of the amount amendment sheet of transmitted lights to the optical diffusion plate itself, and made the amendment sheet unnecessary by vapor-depositing these metal membranes partially etc. in these cases.

[0081] Moreover, in the gestalt of above-mentioned operation, although the case where the amount amendment sheet of transmitted lights was arranged to the outgoing radiation side of a light-scattering light guide plate was described, as only one fluorescent lamp side is expanded and shown not only in this but in drawing 23 , it is good [ this invention ] also as a configuration which arranges the amount amendment sheet 30 of transmitted lights between a fluorescent lamp and the light-scattering light guide plate 12. moreover, this -- replacing with -- the medial surface of the slot of the light-scattering light guide plate 12 -- or the amount amendment side of transmitted lights may be formed in the side face of a fluorescent lamp itself.

[0082] Moreover, in the gestalt of above-mentioned operation, although the case where the so-called prism sheet of one side which formed the prism side in the whole surface was arranged was described, this invention can be applied not only this but when arranging the so-called double-sided prism sheet in which the prism side was formed to both sides, and also when omitting a prism sheet further, it can be applied widely.

[0083] Furthermore, although the case where a rod-like fluorescent lamp was used in the gestalt of above-mentioned operation was described, this invention can be widely applied, when embedding and using the primary light source of various configurations, such as a fluorescent lamp of the shape not only of this but U character, for a light-scattering light guide plate.

[0084] Moreover, although the gestalt of above-mentioned operation described the case where this invention was applied to the surface light source equipment of a liquid crystal display, this invention is widely applicable to surface light source equipments, such as not only this but various lighting devices, a display, etc.

[0085]

[Effect of the Invention] While carrying out distributed mixing of the particle and forming a light guide plate according to this invention as mentioned above, by urging the outgoing radiation of the illumination light according to the quantity of light amendment side formed in some or all of an outgoing radiation side except right above the light source, the whole thickness can be thin-shape-ized and the unnatural brightness nonuniformity of outgoing radiation light can be reduced.

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[Translation done.]